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ON PHYLLODISTOMUM AMERICANUM (N. SP.); A
NEW BLADDER DISTOME FROM AMBLY-
STOMA PUNCTATUM.

HENRY LESLIE OSBORN.

PART I.

The species of this genus which have been reported hitherto have all come from the old world. *P. folium* Olf., from Europe,

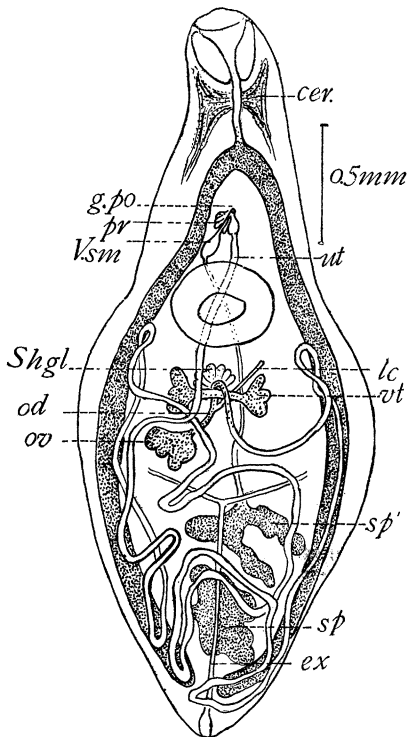


FIG. 1. Ventral view of *P. americanum*, camera lucida, $\times 32$ diam. *g.po.*, genital pore; *ut.*, uterus; *l. c.*, Laurer's canal; *vt.*, vitellaria; *V. def.*, vas deferens; *sp.'* anterior testis; *sp''*, posterior testis; *ex.*, excretory bladder; *int.*, intestine; *ov.*, ovary; *Sh.gl.*, shell gland; *V.sm.*, seminal vesicle; *pr.*, prostate cells.

and *P. patellare*, Sturgis, '97, from Japan, have been till recently the only species known; during 1902, however, Odhner added

four species from fishes of northeastern Africa. I have been greatly interested to find that some of the salamanders of this neighborhood, *Amblystoma tigrinum*, are infected with a species of *Phyllodistomum* unlike any hitherto reported. Pending a later fuller account of the structure of the fluke, this brief notice will indicate the chief points in its anatomy.

The worm is rather uncommon. In twenty-nine salamanders that have been examined for it it has been found in only six cases.

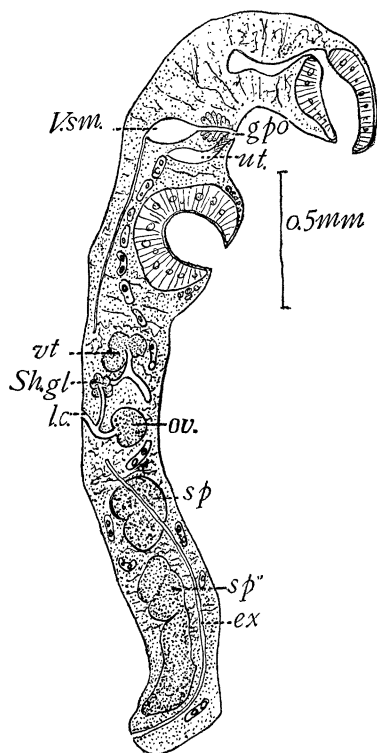


FIG. 2. Sagittal section, $\times 36$. Camera lucida; lettering as in Fig. 1.

The parasite is found in the urinary bladder of the salamander. In one case nineteen flukes were found, but this was exceptional, for two, three or four mature flukes is the maximum found in the other cases, beside perhaps two or three small flukes apparently a young stage of the others. The coarser features of the organization are shown in Fig. 1, a ventral view from a specimen preserved (without compression) in corrosive sublimate solution and stained,

cleared and mounted whole. The form of the body is less spatulate than that of *P. folium* or *P. patellare*, the neck is less distinct. The total length of this specimen is 3.5 mm., its greatest breadth is 1.4 mm., the ratio of breadth to length is thus 40 per cent. In *P. patellare* this ratio is 66 per cent., in *P. spatula* (Odhner, '02) it is 48 per cent. The American form is thus less broad than any reported old world form. There is considerable variation in this respect in my material, some cases being decidedly slender, in one mature specimen studied alive under some compression and measured from the camera lucida drawing, the length is 4.2 mm., the width 0.88 and the ratio of breadth to length 20.9 per cent. This specimen is more than usually narrow, most having the broadened form of Fig. 1.

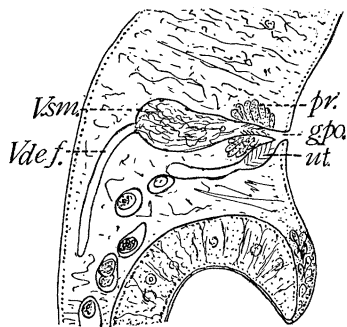


FIG. 3. Section at the genital pore, \times about 120.

There is no pharynx, the œsophagus is short, the intestines branch well forward, and are very long, reaching to the extreme posterior end of the body. The cells of the intestine are provided with very long cilia, as in *P. patellare*; they would probably be very interesting subjects for histological study. In both *P. folium* and *P. patellare* the intestines are somewhat sacculated, but here they are entirely simple.

The excretory system is like that of *P. folium* and *P. patellare* — dorsal posterior terminal pore, a long ventrally located bladder branching anteriorly on the level of the hinder boundary of the ovary. Smaller vessels and flame cells like Fig. 5 of Sturgis, '97, are recognizable in sections.

The chief important internal differences between this species and those previously known are in the reproductive system. The

two testes are both nearly in the middle line, the anterior slightly more on the left side, both are entirely within the hinder third of the body. The anterior testis lies wholly posterior to the ovary, unlike either *P. folium* where it lies on the same level as the ovary, or *P. patellare* where a considerable part is anterior to the ovary. Both testes are very deeply and irregularly lobed, but they are not divided. The lobing is deeper than in any other species of the genus, in some of which (*e. g.*, *P. unicum*, Odhner, '02) they are entire. The cirrhus organ is present, not enveloped in a sac, there is a small seminal vesicle, the ductus ejaculatorius is ciliated and surrounded by prostate cells not marked off from the parenchyma by a membrane. The genital pore is situated in the middle line some distance in front of the ventral sucker.

The ovary is located on the right side and in front of the anterior testis (usually, but on the left side in occasional in-

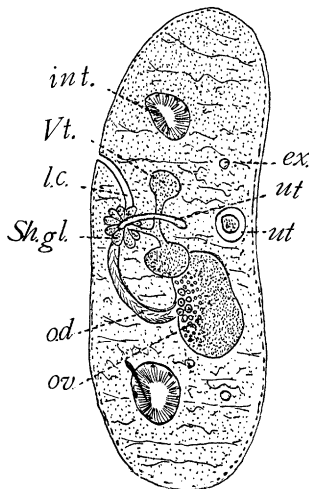


FIG. 4. Combined view from several serial sections showing the relation of the ovary and the neighboring parts, all represented as if on the same level, \times about 120.

stances). It is deeply lobed. The oviduct arises from its dorsal surface (see Fig. 4) and passes toward the anterior end. A passage (Laurer's canal) is given off from the oviduct and runs to the dorsal surface and right side and there opens to the exterior. There is no seminal receptacle. The oviduct running on passes through a distinct shell gland, receiving at this place also the duct from the vitellaria; it then passes on as the uterus arching

over the vitelline duct and passing backward toward the posterior end of the body. The course of the uterus is unlike that of any described member of this genus, and is shown in detail in Fig. 1, where however the coils are somewhat simplified for the sake of clearness. The course is first a forward loop on the left side, then on the same side a loop running to the hind end of the body, having on its return part a side loop down into the space between the two testes, then another loop across the front of the anterior testis, then the uterus crosses to the right side and forms first an anterior loop and finally a long posterior one, at last passing across in front of the ovary and ventrally to and between the two vitella and then dorsally over the ventral sucker to reach the genital pore. There is hardly any atrium (Fig. 3), the male and female ducts meeting almost as they reach the surface. The terminal part of the uterus is ciliated like that of the ductus ejaculatorius. The ova measure 0.052 mm. x 0.050 mm.

The vitellaria lie close together near the center of the body. They are lobed, each consisting of about three parts, one in the center and one in front of this and one behind it. These are not separate follicles, but lobes of a single organ.

Of the generic identity of this form with *Phyllodistomum* of Braun, '99, there can be no doubt. The specific distinctness is equally clear. As it is the first form to be reported from this country I propose the name *americanum* to designate the species.

PART II.

Since the foregoing part of this article was written an article has been published by Stafford, '02, on the American Representatives of *Distomum cygnoides*, in which a new form is described under the name of *Gorgodera translucida*, which bears a considerable resemblance to *P. americanum*. I have also had an opportunity which I owe to the kindness of Professor Stafford of examining some specimens of the species he has described.

The transparency so noticeable in Stafford's form is also noticeable in some of my specimens. My material is derived from two sources, first from worms found by an assistant (Mr. C. C. Tyrrell) in the laboratory and at once (except one studied alive) placed in corrosive sublimate solution, which are all opaque, and

specimens found by opening the bladders of salamanders which had been preserved in formaline for anatomical work. These latter were, many of them, quite decidedly translucent. I think it likely that as soon as I can obtain living specimens I shall find them at least somewhat translucent if less so than Stafford's.

The form of the body in *G. translucida* is slender and parallel-sided, and not at all inclined to a spatulate form. While this is quite unlike the form of Fig. 1, there are among my specimens some in which the body is very slender. I have not yet decided to what extent this may be due to the youth of the specimen. Young worms found in bladders with mature specimens and apparently earlier forms of this species are decidedly slender in outline and not spatulate. I have even found some in which eggs were already filling the uterus in which this elongate form was still present. I have little doubt that fully mature older specimens all become spatulate eventually. These facts indicate a gradual shading from one to the other of these contrasted body forms.

There appears also to be considerable similarity in the arrangement of the coils of the uterus in these two forms.

The location of the ventral sucker is much farther forward in *G. translucida* than in *P. americanum*, being in the former 20 per cent. of the total length from the anterior end and in the latter 32-42 per cent. The testes are located in the hinder third of the body and are deeply lobed in *P. americanum*, and are in the middle third and are nearly entire in *G. translucida*. The ovary is behind the middle of the body not near the ventral sucker and is deeply lobed in *P. americanum*, and is in front of the middle of the body near the ventral sucker and entire in *G. translucida*.

These differences are not entitled to be rated as of sufficient value to justify placing these forms in different genera, unless the body form proves to be a difference of more importance than at present appears. It is the only character that is offered by Looss, '99, by which to distinguish his *Spathidium* (= *Phyllo-distomum* of Braun, '99) from *Gorgoder*a, though some species of the latter (e. g., *G. cygnoides*) differ in having many testes instead of a single pair. For the present and until more is known

of *P. americanum* the spatulate form will have to remain the distinguishing mark of the genus. Should its rank as a critical feature be lost, it seems that we should then be obliged to bring *Gorgodera translucida*, and with it some other species of the genus into the genus *Phyllodistomum*.

HAMLIN UNIVERSITY, ST. PAUL, MINN.,

February 4, 1903.

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